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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: Yingian Chen et al. Ser. No.: 09/933,508
Filing Date: August 20, 2001 Examiner: R. S. Tupper
Atty. Docket No.: RR-1710 GAU: 2652

For: TRANSDUCERS FOR PERPENDICULAR RECORDING WITH
TRAPEZOIDAL POLE TIPS

June 8, 2004

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REPLY BRIEF FOR APPELLANTS

This is a Reply to an Examiner's Answer that was mailed on April 23, 2004. An Appeal Brief was filed February 23, 2004.

I. Grouping of Claims

Regarding the Grouping of Claims, the Examiner's Answer states:

The appellant's statement in the brief that certain claims do not stand or fall together is not agreed with because no reasons have been presented to support the statement.

Appellants respectfully disagree with the Examiner's statement that no reasons have been presented to support the statement that the claims do not stand or fall together.

For example, as noted in the Appeal Brief on pages 8 and 9:

Claim 5 recites "The device of claim 1, further comprising a magnetoresistive sensor disposed adjacent to one of said pole tips." Shukh et al. do not teach or suggest such a sensor, and so claim 5 is separately patentable compared to claim 1.

Claim 6 recites "The device of claim 1, wherein said second soft magnetic layer is magnetically coupled to said first soft magnetic layer

with a third magnetically permeable layer.” Shukh et al. do not disclose such a third magnetically permeable layer that magnetically couples the second soft magnetic layer to the first soft magnetic layer, and so claim 6 is separately patentable compared to claim 1.

Claim 7 recites “The device of claim 1, wherein the media has an easy axis of magnetization substantially perpendicular to said media-facing surface.” Shukh et al. do not disclose that the media has an easy axis of magnetization substantially perpendicular to the media-facing surface, and so claim 7 is separately patentable compared to claim 1.

Claim 14 recites “The device of claim 9, wherein said second soft magnetic layer is magnetically coupled to said first magnetically permeable layer with a third magnetically permeable layer.” Shukh et al. do not disclose such a third magnetically permeable layer that magnetically couples the second soft magnetic layer to the first magnetically permeable layer, and so claim 14 is separately patentable compared to claim 9.

Claim 15 recites “The device of claim 9, wherein the disk contains a media layer having an easy axis of magnetization substantially perpendicular to said media-facing surface.” Shukh et al. do not disclose such a media layer having an easy axis of magnetization substantially perpendicular to said media-facing surface, and so claim 15 is separately patentable compared to claim 9.

As further noted in the Appeal Brief on page 10:

Claim 22 recites “The system of claim 17, wherein said media layer has an easy axis of magnetization substantially perpendicular to said media-facing surface.” Shukh et al. do not disclose such a media layer having an easy axis of magnetization substantially perpendicular to said media-facing surface, and so claim 22 is separately patentable compared to claim 17.

For at least these reasons, claims 1, 4-9, 12, 19 and 22-24, relating to Issue No. 1, do not stand or fall together.

II. Reply to Examiner’s Argument

This Reply does not address the “Grounds of Rejection” included in the Examiner’s Answer, which appears to be a restatement of the Final Rejection, which was addressed in the Appeal Brief.

Instead, this Reply focuses on the “Response to Argument” portion of the Examiner’s Answer. The “Response to Argument” states:

Concerning the 103 rejection over SHUKH et al, Appellant argues the SHUKH et al provides the trapezoidal shape for the write pole only at the air bearing surface.

This is a totally strained reading of the SHUKH et al disclosure. No reasonable reading of the entire SHUKH et al disclosure would come to such a conclusion. Note in the SUMMARY OF THE INVENTION section (see column 2 lines 11-20) that two of the “aspects of the invention” refer to “the write pole”. Further, in the detailed description section (see column 3 lines 56-58) the write pole is stated to have a trapezoidal shape.

These portions of the disclosure clearly refer to the write pole in its entirety, not merely its end portion.

On the contrary, the very same statements to which the Examiner refers, when read in context, show that Shukh et al. only teaches a trapezoidal shape “at the air bearing surface.”

For example, the lines the Examiner cites from the SUMMARY OF THE INVENTION (column 2, lines 11-20) do not refer to a trapezoidal shape. Instead, those lines state:

Another aspect of the present invention is to provide a write pole of a perpendicular magnetic recording head. The write pole comprises a leading edge and a trailing edge, wherein the trailing edge is wider than the leading edge.

A further aspect of the present invention is to provide a perpendicular magnetic recording head comprising an opposing pole and a write pole. The write pole comprises a leading edge and a trailing edge, and the trailing edge is wider than the leading edge.

These “aspects” can be seen in FIG. 10 of Shukh et al., which shows a write pole 32 with a trailing edge (TPW) that is larger than a leading edge (TPWB). FIG. 10 of Shukh et al. also shows an opposing pole 31, in accordance with the second “aspect” cited by the Examiner.

These aspects are also consistent with the “aspects” listed earlier in the “SUMMARY OF THE INVENTION,” such as the trapezoidal cross-section of the write pole “at the ABS” (column 2, lines 2-5).

Moreover, the other section cited by the Examiner to support his interpretation of Shukh et al. (column 3, lines 56-58) also refers to the write pole “at the ABS.” Note that the lines cited by the Examiner refer to FIG. 6, which is a view from the ABS (column 3,

lines 41-43). Also note that the term “trapezoid” and “trapezoidal” pertain to “a quadrilateral plane figure having two parallel and two nonparallel sides.” See Random House Webster’s Unabridged Dictionary, Second Edition, copyright 1997, page 2014 (three copies of which are enclosed). Because the lines cited by the Examiner refer to the write pole 22 that is shown in the ABS view of FIG. 6, and because the term trapezoidal pertains to a two dimensional plane figure, it is difficult to interpret the cited lines as supporting the Examiner’s position.

Another reason to believe that the lines cited by the Examiner refer to the shape of the write pole at the ABS is the statement in Shukh et al. that each canting angle Θ may be greater than 20 degrees (column 3, lines 64-67). As previously noted, there is no disclosure in Shukh et al. teaching how to make a write pole with sides that are sloped at such large angles from perpendicular.

In response to Appellants’ arguments that Shukh et al. do not teach the limitation that “said second soft magnetic layer has a substantially trapezoidal cross-sectional shape at a location at least one micron from said second pole tip that is substantially equal to said shape of said second pole tip,” the Examiner’s Answer states:

Appellants arguments concerning how the structure of SHUKH et al is fabricated are off point. The claims on appeal are head structure claims. However, this line of argument does bring to mind the question of how one would make a write pole with a trapezoidal shape only at the air bearing surface as Appellant urges for SHUKH et al. how would there be no projection of that shape vertically? Such an interpretation makes no sense.

Initially note that the references to the shape of the write pole “at the air bearing surface” were merely quotes from Shukh et al. Moreover, Appellants never suggested that there would be no projection of that shape vertically, but instead that Shukh et al. does not teach that “said second soft magnetic layer has a substantially trapezoidal cross-sectional shape at a location at least one micron from said second pole tip that is substantially equal to said shape of said second pole tip.”

As previously discussed, one way to achieve the structure described in Shukh et al. is by focused ion beam (FIB) etching of the media-facing surface, as described in the present specification (see paragraph 34) and noted in the Appeal Brief (see page 5, lines 11-13). If the FIB etching technique is used, then the pole cross-section at the air bearing

surface could be significantly different from the pole cross-section one micron in from the air bearing surface.

The FIB etching technique of trimming a pole of a head at the air bearing surface is well known in the art. In fact, the Examiner himself has allowed several patents which describe or reference the technique. A brief search of recent U.S. Patents that contain the term "focused ion beam" and the primary examiner "Tupper" yields seven patents. The most recent, U.S. Patent No. 6,633,453, entitled "Shallow Recessed T-Head with Reduced Side-Writing and Method for Making the Same" is an example. The Abstract of that patent states, in part: "The present invention recesses part of the T-head from the air bearing surface by a focused ion beam milling, an ion milling, or an etching process." The detailed description states: "The present invention solves this problem by recessing the tip of pole P3 304 by approximately 5-10 nanometers" (column 4, lines 51-52), which is well below the one micron limitation of the claims on appeal. Three copies of U.S. Patent No. 6,633,453 are enclosed with this Reply Brief.

Another brief search of recent U.S. Patents that contain the term "focused ion beam" and the assignee "Seagate" yields eleven patents. As one example, U.S. Patent No. 6,667,848, entitled "Perpendicular Magnetic Recording Head with Means for Suppressing Noise from Soft Magnetic Underlayer of Recording Media" has the same inventors (Sakhrat Khizroev and Dmitri Litvinov) as U.S. Patent No. 6,513,228 to Khizroev that is relied upon by the Examiner's Answer. Khizroev '848 states, in column 7, lines 1-3: "A perpendicular write head similar to the recording head 10 shown in FIGS. 1 and 2 was made by a standard focused ion beam trimming process from the air bearing surface." Three copies of U.S. Patent No. 6,667,848 are also enclosed with this Reply Brief.

The Examiner's Answer further states:

Concerning the 1 micron recitation, SHUKH et al does not specify a dimension for the vertical height of the write pole. However, SHUKH et al does specify a dimension for the write pole width (TPW) and length (TPL) (see figure 6 and column 4 lines 3-7). These are stated to be 10-2500 nm and 5-500 nm. Certainly one of ordinary skill in the art would have to routinely experiment and optimize the height of the write pole where no height was specified, and the listed 1 micron would be satisfied in view of the dimensions specified for the write pole width and length.

As discussed above, Shukh et al. teaches a trapezoidal write pole shape closest to the air bearing surface, and does not teach such a shape for a cross-section that is disposed one micron from the air bearing surface. The vertical height of the pole is therefore irrelevant. Appellants respectfully object, however, to the Examiner's statement that "one of ordinary skill in the art would have to routinely experiment and optimize the height of the write pole where no height was specified, and the listed 1 micron would be satisfied in view of the dimensions specified for the write pole width and length." This is essentially stating that it would have been "obvious to try" the claimed limitations, an erroneous standard for obviousness that has been repeatedly criticized.

In *Deuel*, . . . the court emphasizes that "obvious to try" is not the standard under 35 USC 103. As stated in *In re Eli Lilly and Co.*, . . .

An "obvious-to-try" situation exists when a general disclosure may pique the scientist's curiosity, such that further investigation might be done as a result of the disclosure, but the disclosure itself does not contain a sufficient teaching of how to obtain the desired result, or that the claimed result would be obtained if certain directions were pursued.

Ex parte Goldgaber, 41 USPQ 2d 1172, 1177 (B.P.A.I. 1996) (quoting *In re Eli Lilly and Co.*, 14 USPQ 2d 1741, 1743 (Fed. Cir. 1990)).

The Examiner's Answer continues by asserting:

Concerning claims 6 and 14, Appellant argues that SHUKH et al does not show a third layer/member magnetically coupling the write and return poles. This is in error. As shown in figure 2, the portion (not numbered) of the head that projects through the center of the coil (14) reads on these limitations.

Appellants again respectfully disagree with the Examiner's Answer. Initially note that the cross-hatching of FIG. 2 of Shukh et al. shows write pole 12 as a single piece, not the third layer/member/portion alleged by the Examiner's Answer.

In addition, Shukh et al. states that FIG. 2 of that reference refers to a conventional head (column 3, lines 12-13). Claim 6 presently on appeal, however, depends from claim 1, which includes the limitation "said second soft magnetic layer has a substantially trapezoidal cross-sectional shape at a location at least one micron from said second pole tip that is substantially equal to said shape of said second pole tip." Similarly, claim 14 depends from claim 9, which includes the limitation "said second soft

magnetic layer has a substantially trapezoidal cross-sectional shape at a location at least one micron from said second pole tip that is substantially equal to said shape of said second pole tip.”

Assuming arguendo that FIG. 6 of Shukh et al. teaches “said second soft magnetic layer has a substantially trapezoidal cross-sectional shape at a location at least one micron from said second pole tip that is substantially equal to said shape of said second pole tip,” and *assuming arguendo* that FIG. 2 of Shukh et al. teach a third layer/member/portion, the Final Rejection has presented no reasoning for modifying the head of FIG. 2 with that of FIG. 6 or vice-versa. For at least these reasons, the Final Rejection has not presented a prima facie case of obviousness for either claim 6 or claim 14.

Regarding claims 7, 15 and 22, the Examiner’s Answer states:

Concerning claims 7, 15, and 22, Appellant argues that SHUKH et al does not show the medium to have a layer with an easy axis of magnetization substantially perpendicular to the medium facing surface of the head. This is also in error. Note figure 2 and column 1 lines 30-33, SHUKH et al states and shows the medium to be conventional two layer perpendicular recording medium. Appellant’s own description of the prior art (see page 2 lines 8-18 and Prior Art figure 2) acknowledges that the conventional perpendicular recording medium has a layer with an easy axis of magnetization substantially perpendicular to the media facing surface of the head.

Once again Appellants respectfully disagree with the Examiner’s Answer. Neither Shukh et al. nor the Final Rejection even mentions the words “easy axis,” and thus the Final Rejection does not present a prima facie case of obviousness of claims 7, 15 or 22.

Regarding claims 13 and 15, the Examiner’s Answer states:

Concerning the 103 rejection over SHUKH et al in view of KHIZROEV et al, Appellant only argues that KHIZROEV et al does not show the trapezoidal shape. This is off point. KHIZROEV et al is relied upon for showing the well known combination of perpendicular write heads and MR read heads in one structure.

Appellants also respectfully disagree with this statement of the Examiner’s Answer. Because Shukh et al. does not teach the limitations of the independent claims, the fact that Khizroev et al. ‘228 is alleged to teach a limitation of the dependent claims is immaterial, unless Khizroev et al. ‘228 teaches the limitations of the independent claims.



III. Conclusion

Appellants respectfully assert that all the pending claims are allowable and therefore request reversal of the Examiner's rejections. The Examiner's Answer has not mitigated the deficiencies of the Final Rejection, which did not state a prima facie case of obviousness for any of the pending claims. This Reply Brief is being submitted in triplicate along with three copies of each of the items mentioned above as being enclosed with the Reply Brief.

Respectfully submitted,

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop Appeal Brief, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313, on June 8, 2004.

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